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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/673,466	09/30/2003	Tatsuo Shimizu	243397US2TTCRD	1994
22850	7590	07/13/2005	EXAMINER	
OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C.			TRAN, THIEN F	
1940 DUKE STREET			ART UNIT	
ALEXANDRIA, VA 22314			PAPER NUMBER	
			2811	

DATE MAILED: 07/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

A

**Office Action Summary**

Application No.

10/673,466

Applicant(s)

SHIMIZU ET AL.

Examiner

Thien F. Tran

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 22 April 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 1-6, 12 and 14-20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 7-11 and 13 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 09/30/03.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Election/Restrictions***

Applicant's election of species 4 of Figure 13 with claims 7-11 and 13 readable thereon in the reply filed on 04/22/2005 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 8 and 9 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 8 recites the limitation "the thickness  $d_m$  and the relative permittivity  $\epsilon_m$  of the  $m$ -th barrier layer" in lines 4-5. There is insufficient antecedent basis for this limitation in the claim.

Claim 9 is necessarily rejected since this claim directly or indirectly depends upon the rejected base claim.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 7 and 13 are rejected under 35 U.S.C. 102(b) as being anticipated by Ma et al. (US 6,407,435).

Ma et al. discloses an insulating film (see Figure 3) comprising:  $n$  ( $n$  being an integer larger than 2) layers of barrier layer (130, 150) consisting of a material having a bandgap larger than a first bandgap and having a relative permittivity smaller than a first relative permittivity; and  $(n-1)$  layers of well layers 140 consisting of a material having a bandgap smaller than the first bandgap and having a relative permittivity larger than the first relative permittivity, discrete energy levels inherently formed in the well layer by a quantum effect, each of the barrier layers and each of the well layers being stacked by turns, and discrete energy levels inherently formed in each of the well layers by a quantum effect.

Regarding claim 13, Ma et al. discloses an electronic device comprising a semiconductor layer 112; an insulating film 116 provided on the semiconductor layer, including:  $n$  ( $n$  being an integer larger than 1) layers of barrier layer 130 consisting of a material inherently having a bandgap larger than a first bandgap and inherently having a relative permittivity smaller than a first relative permittivity; and  $(n-1)$  layers of well layers 140 consisting of a material inherently having a bandgap smaller than the first bandgap and inherently having a relative permittivity larger than the first relative permittivity, discrete energy levels inherently formed in the well layer by a quantum effect, each of the barrier layers and each of the well layers being stacked by turns, and discrete energy levels inherently formed in each of the well layers by a quantum effect; and a gate electrode 118 provided on the insulating film, an electric field in the semiconductor

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layer under the insulating film 116 being controlled by applying a voltage to the gate electrode.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 10-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ma et al. (US 6,407,435).

Ma et al. as described above does not disclose a thickness of at least one of the well layers 140 being not larger than 5 angstroms. It would have been obvious to one having ordinary skill in the art at the time the invention was made to form the thickness of at least one of the well layer having the claimed range of thickness, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

Regarding claim 11, ma et al. discloses an insulating film comprising: n (n being an integer larger than 2) layers of barrier layers 130 consisting of a material inherently having a conduction band whose energy level is higher than an energy level of a conduction band of silicon by 0.5 electron volts or more and inherently having a valence band whose energy level lower than an energy level of a valence band of silicon by 0.5 electron volts or more; and (n-1) layers of well layers 140 consisting of a material

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inherently having bandgap smaller than a bandgap of  $\text{SiO}_2$  and inherently having a relative permittivity larger than a relative permittivity of  $\text{SiO}_2$ , each of the barrier layers 130 and each of the well layers 140 being stacked by turns that inherently form a multi-quantum well structure. Ma et al. as described above does not disclose thicknesses of the well layers 140 being not larger than 10 angstroms. It would have been obvious to one having ordinary skill in the art at the time the invention was made to form the thicknesses of the well layers having the claimed range of thickness, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thien F. Tran whose telephone number is (571) 272-1665. The examiner can normally be reached on 8:30AM - 5:00PM Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on (571) 272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

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For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

tt  
July 10, 2005



**THIENTRAN  
PRIMARY EXAMINER**